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Smart campus

The next-generation connected campus

The higher education landscape is at the crossroads of an amazing digital shift. Higher education is faced with complex disruption from a changing student body who are digital natives expecting a more intuitive experience that fosters positive outcomes. This is where a digital campus, also referred to as a smart campus, plays a role in transforming the lives it touches. Innovative institutions recognize the importance of true transformation using technology that enables frictionless, touchless, and intuitive experiences driven by a digitally connected community.

Students are consumers and customers who are empowered with choice. Armed with social awareness, the choices of today's students are based on purpose, value, and experience. For this reason, institutions should reflect on their goals and reshape how they move forward using advancements that other sectors have grown accustomed to. Colleges and universities should drive interaction that serves intuitively and fosters positive outcomes built on innovative practices leveraging emerging technologies to enhance the consumer experience. Faculty and staff also expect a digital workplace that allows them to focus on meaningful activities that serve a true purpose and promote the mission of the campus. Both of these shifts may require institutions to become digitally connected.



Innovations used in smart banking, smart retail, smart digital workplaces, and smart venues like hospitals and stadiums could be extended to higher education campuses. These smart environments are enabling an easy and seamless experience by leveraging the most advanced and next-generation technologies available to them. And more importantly, they continually modernize and adjust their practices to meet the needs of their constituents. To stay sustainable and relevant, institutions should employ technology and analytics-based insights to enhance the well-being of the communities in which they are rooted.

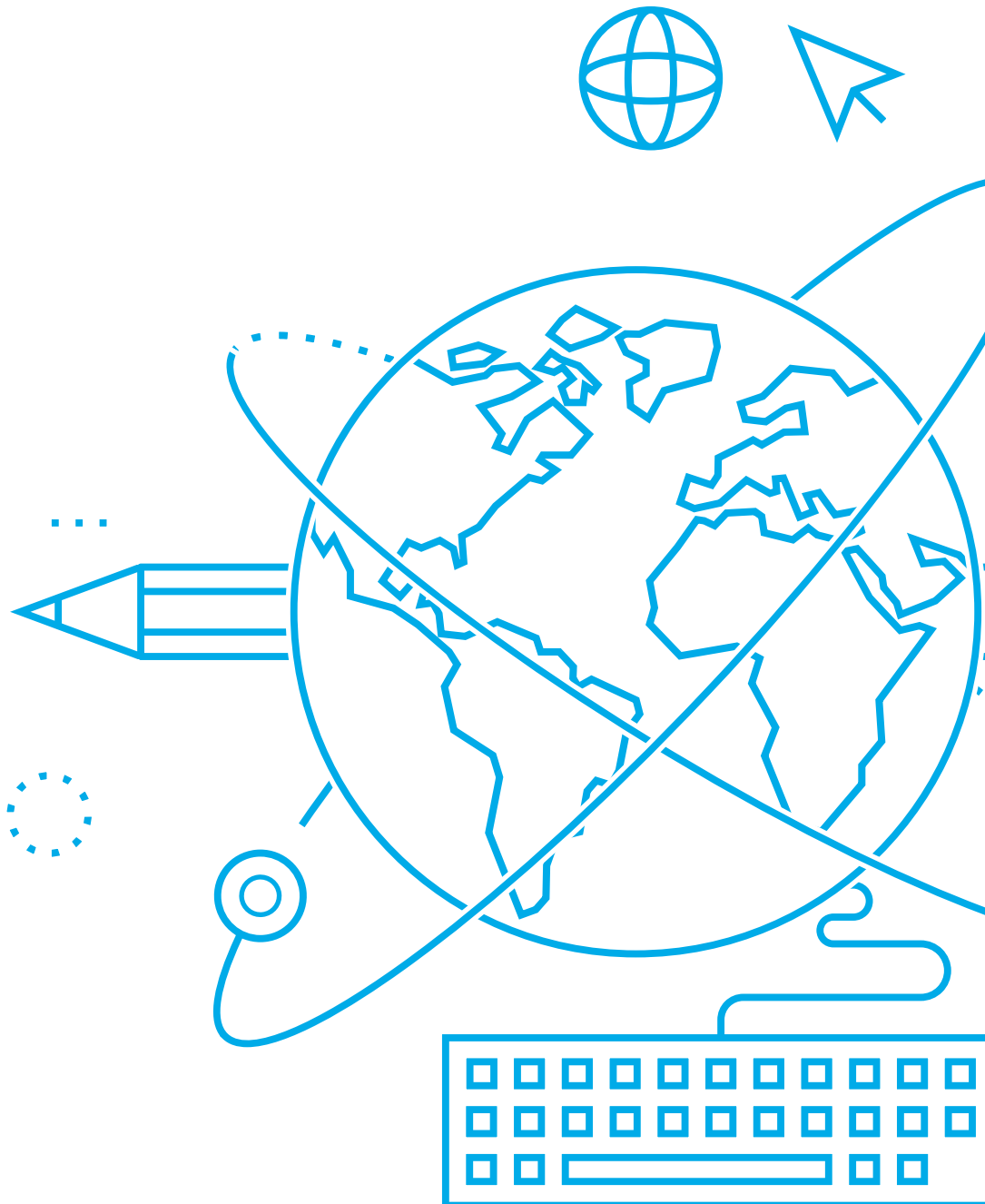
We recognize that higher education campuses are epicenters of activity, and for that reason, leveraging smart campus strategies can improve the experience of students, faculty, administrators, researchers, practitioners, and communities.



Deloitte smart campus outcomes

In order to design a smart campus, colleges and universities should define a common understanding and vision. Deloitte defines a smart campus as a paradigm shift to leverage innovative next-generation technologies to create a “digitally connected” campus that:

- Drives **positive outcomes** by fostering dynamic engagement.
 - Enables **development and delivery** of new business models and revenue streams.
 - Fosters a **digital culture** to create and collect data, derive insights from that data, and utilize the insights.
 - Provides **contextual information** to constituents based on their behaviors, intentions, and locations.
 - Guides students each with an **insight-driven path** toward their educational success.
 - Provides faculty with information that allows them to **foster positive interactions** with students, other faculty members, ecosystem partners, and the community.
 - Leverages new **interactive learning models** by using digitally augmented reality and virtual reality technologies.
 - Improves **operational efficiency and effectiveness** of current education business models continually through state-of-the-art technologies and operating models.
- Leverages **innovations** (small and large) from other smart environments and industries.
 - Increases value by leveraging existing **infrastructure investments**.
 - Becomes a model to design, implement, and test sustainable solutions for **improving socioecological aspects** of surrounding communities, regions, and cities.
 - Evolves to create and maintain a **digital campus** of the future—the next-generation campus that continually modernizes iteratively over time.



Deloitte smart campus framework

A smart campus is more than a system or collection of applications, platforms, or infrastructures that are being leveraged in a siloed manner around campuses. It requires a strategic framework that fosters a connected ecosystem and creates a new, exciting experience for all. Emerging technologies are required in order to develop the next-generation campus—technologies that are woven into the fabric and processes of an institution to create smart communities for its students, constituents, and citizens. Below are the smart campus capabilities within the framework to promote the digital experience and to foster positive outcomes.

Deloitte smart campus capabilities framework



Smart student
Digital student



Smart classroom and lab
Next-gen classroom and labs



Smart teaching and research
Instruction and research



Smart student administration
Student administration



Smart housing and dining
Logistics and services provisioning



Smart mobility
Campus mobility and safety



Smart events
Event logistics and services



Smart operations
Campus and building operations



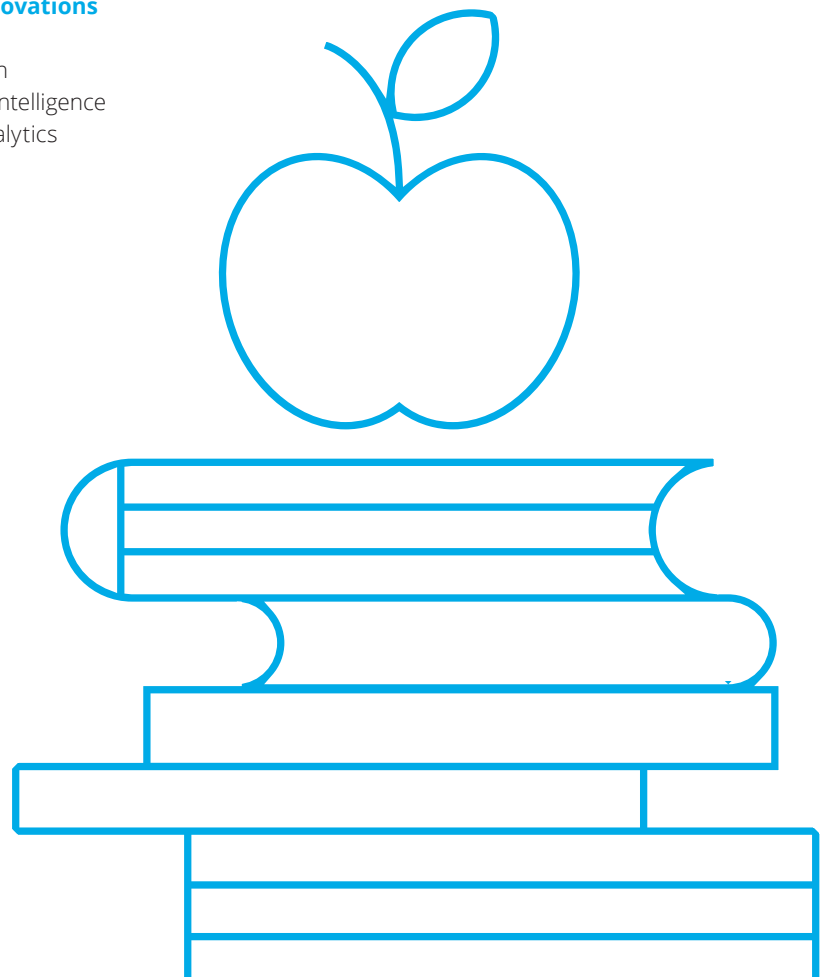
Smart stadiums
Constituent experience and operations

Smart campus design example

Within a smart campus design framework, organizations shift their focus from processes to outcomes and then align the use cases appropriate for their institution. They then can select proven innovations to foster the desired outcomes. Below is just one of many strategic designs that can be executed within Deloitte's smart campus framework.

Smart student administration: Improving the financial aid processes

- **Identify outcomes**
 - Better student services
 - Reduced wait times
 - Mitigate FA compliance issues
 - Access to information
 - Expedite processes
- **Select use cases**
 - Deploy virtual assistants
 - Automate and reduce data errors
 - Reservation and queue management
 - AI-triggered workflow
 - Digital verification
- **Deploy innovations**
 - RPA
 - Blockchain
 - Location intelligence
 - Venue analytics
 - Chatbots



Deloitte smart campus technology architecture

It's also vital for a campus to leverage its existing investments in heterogeneous technology environments and build on them to enable transformation. For this reason, colleges and universities will need a network that can provide high resilience, high performance, and proactive security. Such a strategically designed network for a smart campus will serve as the foundation of a holistic technology architecture stack that enables its smart interactions.

The vision of a smart campus relies on a diverse stack of technology capabilities. A robust smart campus technology architecture should have the following layers:

- Presentation/channels
- Analytics and automation
- Data platform
- Integration
- Enterprise applications
- Infrastructure
- Security and risk

Deloitte smart campus principles

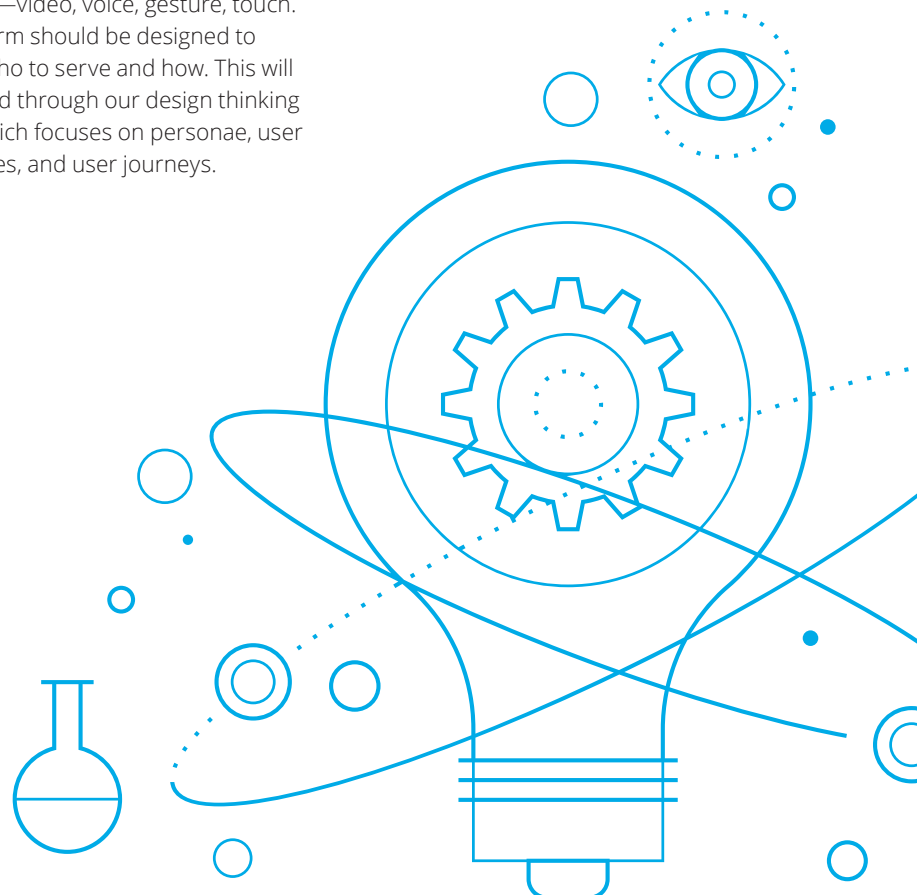
The definition of smart campus varies from one stakeholder to the next and in many cases is defined by the purpose it serves. The role in enhancing its constituents' quality of life has become the focal point in the design of smart campus. The key element common in all design is the importance of interconnectivity and the benefits it provides. At Deloitte, we focus on key principles that foster a connected and consumer-grade experience for anyone who interacts with the campus.

• Intuitive and simple to use:

Today's students are digital natives, and other higher education constituents will want to interact with a system that is instinctive and effortless to use. The platform should deliver an amazing and intuitive user experience. Real intelligence and value for a smart campus will be derived from thinking about personae, user journeys and underlying use cases, and user experiences when interacting with a smart campus platform.

• Design thinking and persona-centric:

Interaction with the platform should be touchless and enabled by multiple interfaces—video, voice, gesture, touch. The platform should be designed to address who to serve and how. This will be resolved through our design thinking theme, which focuses on personae, user experiences, and user journeys.



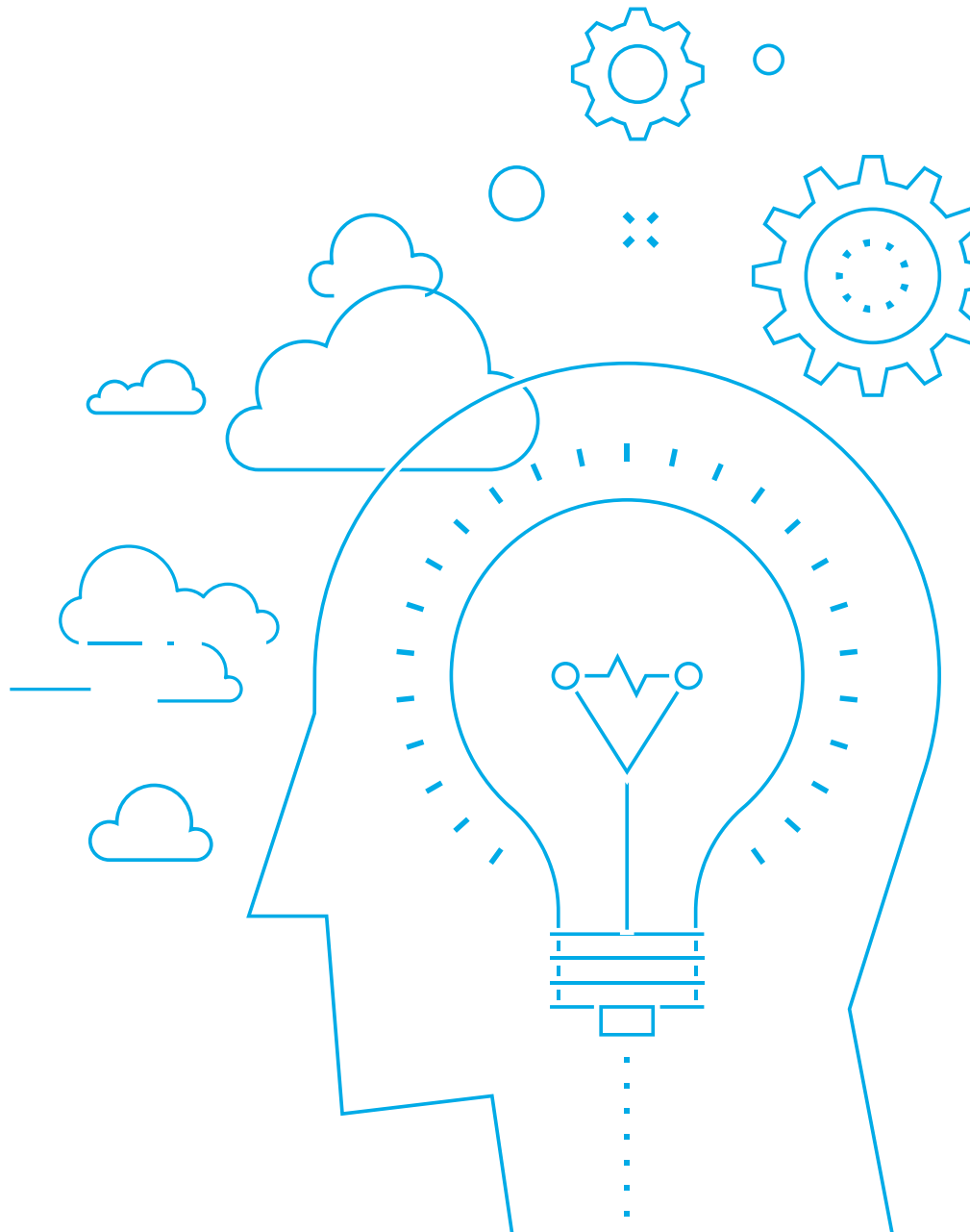
- **Modular, adaptive, flexible, and intelligent:**

Campus needs and the technology to support them will constantly evolve. At its best, the solution is not locked into a set of technologies and business capabilities designed only for day one. To address this challenge, a smart campus solution can use a domain-driven design architecture that would be based on microservices that guide campus transformation. These microservices are self-contained and reusable components of functionality. The goal is to create software capabilities and solutions that are loosely coupled and leverage capabilities and solutions that have been previously developed (where applicable). This architecture approach allows for the flexibility of “morphing” services, which allows the smart campus to evolve over time and allows capabilities to be reused in any manner. This, in turn, helps systems to be designed in a manner that can help ensure the ever-changing needs of end users are addressed.

Every time stakeholders like students and faculty interact with a smart campus solution or platform (e.g., use a mobile app, leverage a learning management system), they create digital footprints or “exhaust.” All this data can be captured and used to train the solution and make it smarter. As a result, the solution can learn to preemptively provide the right stakeholder the right information at the right time and right location (context). It can also allow the solution to enable AI-based automation of standard, rote processes, and/or user experiences and alert people to handle the exceptions in workflows and processes.

- **Adoptable and scalable:**

The solution is designed to allow colleges and universities to collaborate with peers and scale massively. While most higher education institutions are local in their reach and scale, a smart campus solution should allow for global scalability in order to meet the institution’s goals. The solution can be able to leverage digital tools and technologies to provide data-driven experiences while enabling access and scale. Whether students are in a physical classroom on campus or in a virtual online classroom (participating from anywhere in the world), the solution can be built to support them.



Benefits of a smart campus

With other industries incorporating smart environments, higher education institutions serve their respective constituents in a similar manner and in many cases provide services to the same ones. A person-centric smart environment enables smart campuses to complement and align with the overall smart environment strategy, allowing campuses to gain maximum efficiency, foster sustainability, and improve the daily conditions for their constituents.

A smart campus can help improve three important factors: experience, efficiency, and education. It can help reshape how students study, how they learn, what they learn, and how they interact with an institution. And it can be the catalyst for the transformation that will likely enable campuses to address the future of learning and the future of work while reshaping the campus experience. As needed, it can continue to serve the traditional campus while enabling it to adopt new approaches to serve in a manner that their digitally native stakeholders have come to expect.

Cultivate a digitally connected experience

- A well-designed infrastructure and data strategy provide meaningful information that allows for responsive intervention between students, faculty, staff, and alumni.
- Today's robust processing capabilities help administrative staff analyze their enormous amounts of data, then proactively respond and foster positive outcomes.
- Provide collaborative educational tools that can support the academic journeys of all types of students.
- Enable connected automations to create a seamless and intuitive campus experience.

Address cost pressures

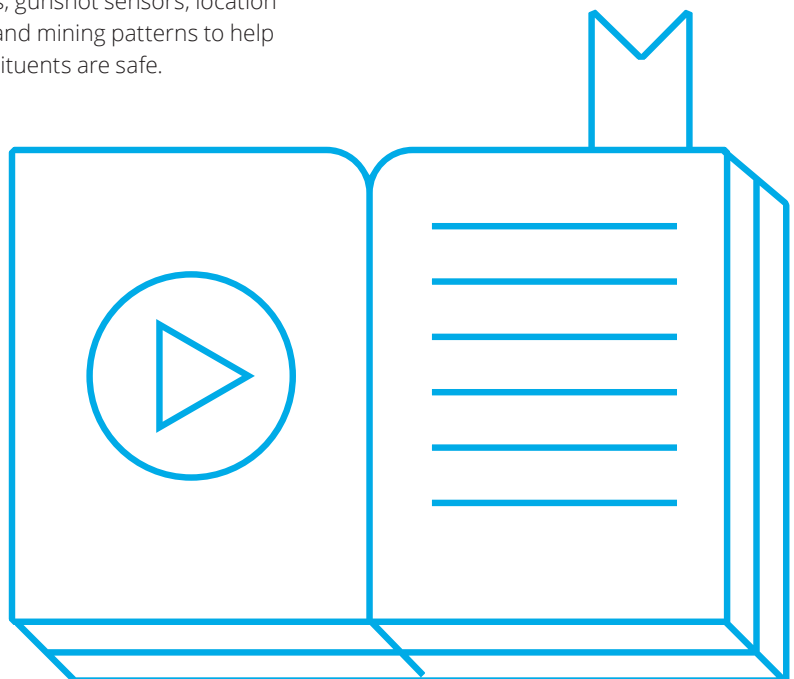
- Being a smart campus enables institutions to streamline processes, reduce costs, and become operationally more effective through insight, automation, and the replacement of antiquated procedures with innovative practices.
- Campuses are able to use insights gained from a data strategy to proactively address issues, enabling efficiency through thoughtful redesign.
- Similar to a city, maintaining buildings, facilities, landscapes, and power grids has become vital to a campus's operational efficiency.

Elevate communication and awareness

- Students, faculty, and staff receive a much more intuitive experience as they navigate the campus and surrounding communities. Interactions are more user-friendly and consumer-like by design.
- Students are empowered by choice and social awareness, and campuses can proactively interact and inform their constituents.

Provide sense of safety

- The fabric of connectivity enables campuses to cultivate a sense of safety. A smart campus can use advancements like facial recognition, reporting and alert systems, gunshot sensors, location intelligence, and mining patterns to help ensure constituents are safe.



Impart a quality of life

- Improved connectivity for constituents with Wi-Fi and mobile applications that are responsive, reliable, and intuitive address their needs effectively and efficiently.
- Enables a campus to design and maintain a more efficient transportation and mobility strategy. Transportation is a key factor that impacts a student's ability to continue his/her education. In many cases, surrounding city buses and trains play an integral role in getting students to and from campus. Also, since more and more students are adult workers, they need convenient options between work and campus.
- Fostering healthier constituents within the campus. With the use of wearables, schools and communities can promote a healthier lifestyle. While these wearables inform constituents of their health patterns, this information could also be used by campuses to address student health issues, which could impact retention as well as promote a healthier community and potentially could reduce the impacts to health and human services.

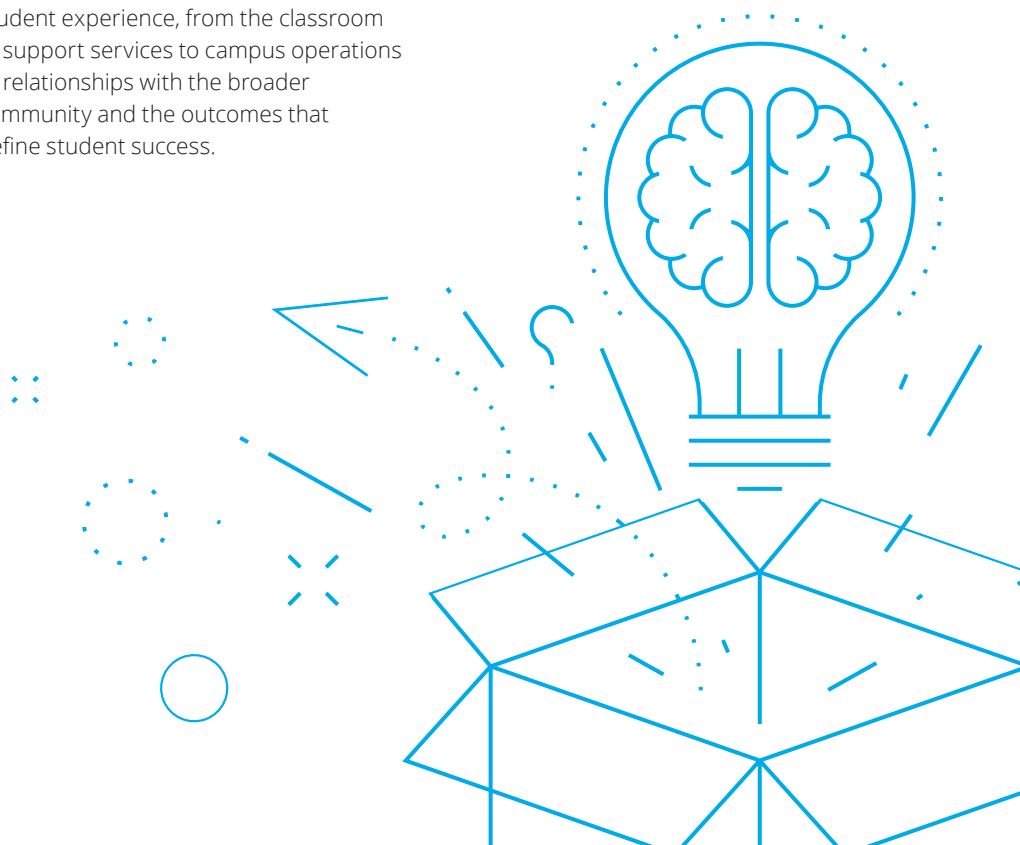
Foster inclusion and equity

- Understanding the patterns around various activities and initiatives within a campus can help a school foster inclusion and drive equity. Dashboards designed around inclusion and diversity can provide valuable, actionable insight.
- The knowledge gained from education drives the economy, and improving access to education will only foster a more inclusive community.

Smart campus impact on student success

Especially given the implications behind changing demographics as more lower-income, underrepresented minority, and first-generation students pursue postsecondary study, colleges and universities must develop new approaches to effectively support their students on the path to graduation. As students with “nontraditional” backgrounds now represent the majority of degree seekers, traditional support structures have become inadequate. However, the innovations within a connected campus are designed to foster measurable improvements in improving persistence rates, decreasing time to graduation, and increasing overall completion rates, as well as augmenting other student success factors. As a smart campus strategy is thought through, it will be tailored to the institution and the constituents it serves.

These institutions will be focused on key elements such as quick and responsive experiences, including access to information in a timely manner to propel students through their academic journey. A campus that leverages a smart campus framework will develop a holistic, student-centered strategy across all dimensions of the student experience, from the classroom to support services to campus operations to relationships with the broader community and the outcomes that define student success.



Smart campus impact on the future of work

Like other industries, campuses are being introduced to next-generation technologies like artificial intelligence (AI), machine learning (ML), blockchain, and automation. Using these technologies, innovation through a smart campus design positions offices and departments to streamline processes to service students, faculty, and other constituents. For these reasons, activities that current staff engage in throughout the campus will change, and new jobs requiring new skills will present themselves.

The endless array of change leaves us asking two key questions:

1. What is the role of the institution in preparing their students for the future of work?
2. How will institutions, themselves, take advantage of the advancements within the future of work to better achieve their missions, improve performance, and be more operationally efficient?

These discussions will help institutions reshape the offices and roles of the various staff in each unit. The digital workplace, employee mobility, the gig economy, and open talent model are changing the way work will be done on campus and are re-framing what preparation for the workforce looks like. Reallocating personnel to more meaningful activities will be an exercise that all next-generation campuses will have to embark on.

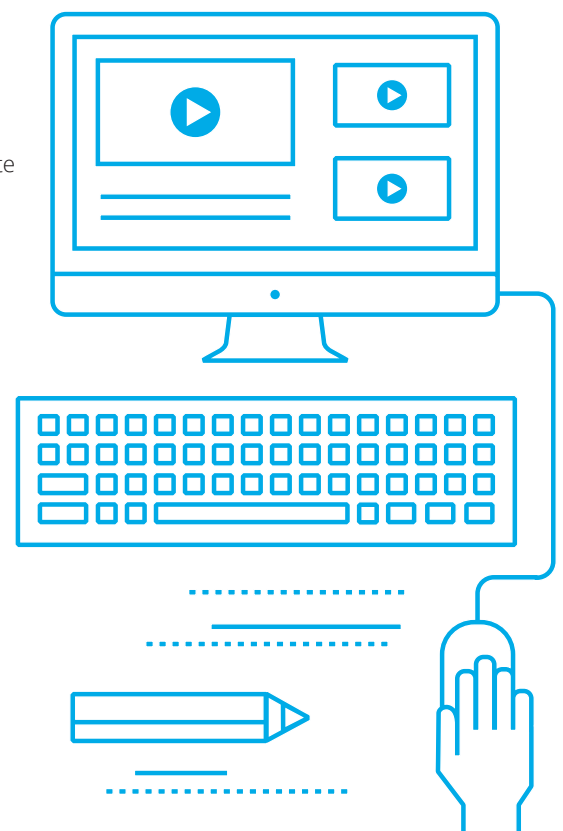
As innovative practices get absorbed on campuses and in industry, academic leaders will recognize careers, jobs, and roles that may no longer be relevant. This will also enable departments and faculty to revisit programs, curricula, and learning outcomes to ensure they are positioning their students for the work of the future.

Smart campus impact on cyber and data security

As campuses adopt more and varied ways of interacting with internal and external constituencies, securing proprietary information and other critical institutional assets becomes exponentially more difficult, and meeting regulatory requirements more complex. The increasing ubiquity of IoT and its interconnections in higher education campuses creates a complex digital environment where cyberattacks and vulnerabilities in one area can have a cascading effect on multiple areas and the consequences can go beyond the usual data loss, financial impact, and reputational damage risks. The implications could include disruption of crucial educational services and infrastructure and could potentially impact overarching smart cities ecosystem.

Our smart campus security approach enables higher education institutes to implement an integrated cyber risk management framework that provides structure to identify threats, vulnerabilities, and implement cyber solutions to manage risks. The cyber risk capability is an integral part of our smart campus framework and comprises industry standards, legal, and regulatory requirements to establish the context of how cyber risk may affect an entire ecosystem including academic community, services, infrastructure, and processes.

As part of our smart campus strategy with universities and colleges, we promote a collaborative focus to help campuses establish effective controls around sensitive assets and reduce risk while fostering efficiency.



Smart campus impact on the future of learning

A smart campus provides colleges and universities technological advancements to refine the quality of classroom instruction and student learning. Facilitating this process can be a critical task, considering that not only is the professor educating many students at any given time, but each student has their own learning style and speed.

A smart campus offers a variety of smart, technological solutions that add value to student learning and their time on campus. Adaptive advising tools can help students actively see their personal “college roadmap” and allow them to pick classes that will help them learn the skills and knowledge required not only for graduation, but the prospective careers post-higher education. In other words, in addition to creating a better student experience, a smart campus will help students become more employable. A smart campus brings these capabilities to students and enables them to achieve a greater opportunity for success.

Why smart campus?

In summary, we are experiencing a digital culture that will enable us to transform a market. Today in our homes, cars, stores, and banks we experience advanced technologies that provide us with smart environments. Higher education institutions have been inundated by various infrastructures and platforms siloed by strategy that often does not go past the respective unit and stakeholders they service. They have invested in dispersed systems, beacons, Bluetooth technologies, Wi-Fi, sensors, smart classrooms, and large ERP/SIS platforms that play a siloed role with students, faculty, staff, and others who arrive on campus. Imagine if these technologies communicated in a manner that seamlessly initiated positive outcomes through intuitive and intelligent interactions. As campuses address the needs of their students, they may incorporate a smart campus strategy that will foster efficient practices. As part of developing a smart campus strategy, colleges and universities should move away from their focus on transactional process redesign and focus on leading practices and respective outcomes that will differentiate them from their peers.

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